Description:

Clamping device and process for the production thereof

The invention relates to a clamping device having two grip jaws, both merging into a pincer portion and being linked to each other in the transition area by a crosspiece. This clamping device may take the form of a clamp where, in the non-actuated state, the grip jaws lie preferably adjacent to each other in a biased state, whilst the pincer portions are spread apart, or of a grip in which the grip jaws, in the non-actuated state, are opened and spaced apart. The invention also relates to a process for manufacturing such clamping devices.

It is the object of the present invention to provide a clamping device of the kind described which can be manufactured at low costs.

~~In accordance with the invention, this object is achieved by~~ means of the features presented in Claims 1 and 10. Advantageous embodiments of the invention are characterised in the dependent ~~claims~~.

According to the present invention, the clamping device or its half-profiles are integrally made of plastic - for example PVC, POM, PC or PP, the pincer portions taking the form of hollow chamber profiles. This considerably reduces the amount of material used, a high degree of rigidity being achieved for the pincer portions and/or the grip jaws in spite of thin walls. Accordingly, it is further suggested that the grip jaws also take the form of hollow compartments.

If the grip jaws of the clamping device in their non-activated state are adjacent to each other and the pincer portions at the same time spaced apart, preferably spread apart at an angle, the clamping device is a clamp the jaws of which are opened against the force of a spring by pressing the pincer portions onto each other. In this process, the connecting faces of the grip jaws on

both sides, along with their pincer portions adjacent thereto (which, preferably, are configured in a plane symmetrical to the longitudinal axis of the clamping device), are linked together with a crosspiece so formed and dimensioned that the elastic properties of this latter displace the opened grip jaws again into the closed state, when the pincer portions are released.

Provision may, however, also be made, for the pincer portions to be forced apart by a spring device, for which purpose, for example, a spring-loaded metal or plastic clasp may be positioned between the pincer portions. Provision may, however, also advantageously be made whereby the spring device is formed by extensions which are formed at the ends of the pincer portions, are bent round inwards and which run at an angle towards each other and, preferably, whose free ends are adjacent to each other. They may, however, also be connected to each other at the ends.

The extensions which are bent over and inwards preferably enclose an angle of 60 to 90° and, when the grip jaws open, are pressed against each other in such a way that they finally lie mutually adjacent along their straight ends, this elastic deformation bringing about a considerable elastic force which presses the grip jaws powerfully together when the pincer portions are released.

The grip jaws of the clamping device in accordance with the invention can, however, also be opened in their non-actuated state, preferably spread apart, so that, together with pincer portions which are similarly spread apart, they approximate the shape of the letter "X", the length of the legs provided by the grip jaws, however, preferably being shorter than those of the pincer portions. With this embodiment, the clamping device forms a clamp, the jaws of which, by the pressing apart of the pincer portions, can be pressed against each other, in order to form, for example, a tube or a bag in such a condition.

Provision is also hereby made for the pincer portions to be connected to a spreader device which not only press s apart the pincer portions to close the grip jaws, but can also preferably maintain the grip jaws in their closed condition. A particularly advantageous proposal here is that the spreader device should have two webs connected to the ends of the pincer pieces by means of two attenuated portions or film hinges, said webs being connected to at least one more attenuated portion or film hinge, the two pieces being arranged in alignment in such a manner as to produce an overall length which is somewhat greater than the distance between the free ends of the pincer pieces in the closed state.

With this embodiment of the invention the restoring force of the film hinges is such that, in the pressed-inwards over-centre position, the webs exert on the pincer portions such a spreading force that the grip jaws remain closed and biased. Accordingly, the film hinges prevent the webs from moving in complete freedom in relation to each other and to the pincer portions, instead taking up a position, after being displaced beyond the centre point, in which they press the pincer portions apart. This position may also be defined by stops on the pincer portions and the webs.

It is further proposed that, in the area where the two webs join, a pincer element be positioned which, in each case, is connected with the ends of the webs on both sides via a film hinge or an attenuated portion. Said pincer element projects outwards and may take the form of a hollow body.

The sequence of film hinge, web, film hinge, pincer element, film hinge, web, film hinge goes to form the spreader device and simplifies the opening of the grip by enabling the webs on the pincer element to be drawn beyond the dead centre point into the release position. Obviously, the grip does not necessarily have to be equipped with such a pincer element; instead, the over-dead centre position of the webs can also be released by

pressing the pincer portions laterally together, if the dimensions of the pincer portions and the webs are chosen accordingly.

In accordance with the invention, it is further proposed to make the clamping devices and their half-profiles using the plastic extrusion process. Though it is also possible to manufacture the clamp individually or in several pieces hanging on to each other using the injection moulding process, the plastic extrusion process is particularly advantageous, since it presents a way of extruding any length of continuous plastic with the (half) profile of the clamping device and from which, after the cooling process, the clamping devices can be cut off into the desired widths or be broken off at the predetermined breaking points and joined to each other if necessary. This means that the clamping devices in accordance with the invention can be made at particularly low costs since a separate tool is not required for the different widths.

Moreover, this method offers the possibility of generating a biasing force after extrusion which enables the grip jaws to lie adjacent to each other. This biasing force may be produced in a calibrating area - e.g. in a bath of water, where the pincer portions which, for example, have already been partially hardened, may be spread or pressed together between rollers.

Accordingly, the invention provides for universal clamps and universal clips which can be manufactured in various widths using one and the same tool, if the particularly preferred extrusion method is used. Different levels of biasing force in the clamps can be produced in a calibration process after extrusion, so that the clamps can securely hold both thin objects (such as a sheet of paper) and relatively thick objects (such as a pile of paper sheets). Moreover, a softer material can be co-extruded at the holding or clamping points, in order to increase the slip-inhibiting properties. The clamp in

accordance with the invention may also comfortably be operated with one hand.

Several embodiments of the invention will be described in more detail below with reference to the drawings, wherein:

Fig. 1A to 1C
show a perspective view and also a front view of a first embodiment of a clamp in accordance with the invention in the closed and open conditions;

Fig. 2A to 2C
show a perspective view and also a front view of a second embodiment of a clamp in the closed and open conditions;

Fig. 3A to 3C
show a perspective view and also a front view of a third embodiment of a clamp in the closed and open conditions;

Fig. 4A to 4C
show a perspective view and a front view of a grip in accordance with the invention in the closed and open conditions;

Fig. 5 shows a clamp, the two halves of which are manufactured in mirror image by a plastic extrusion process and finally joined together to form an integral component by means of welding;

Fig. 6 shows a modified embodiment wherein a spring device is integrally moulded on or inserted;

Fig. 7A and 7B
show a further modified embodiment of the clamp, wherein in the left-hand half, the preferred co-extrusion process used is illustrated, whilst in the half on the left, a snap-in region of the transition area is shown; and

Fig. 8 shows a further modified embodiment of the clamping device, wherein an identical and extruded basic element is joined to a multi-clamp.

Fig. 1A shows a first extruded length of clamp section. Lines 1 in the figure indicate that, for example, a multiplicity of clamps may be cut from the extrusion in the width prescribed by the distance between the lines, or broken off at marked predetermined breaking points, with it being possible, however, that the clamp has the entire width shown. For such an eventuality hole 2 is provided, by means of which the clamp may be hung on a hook.

The first embodiment, designated in its entirety with reference numeral 3 and relating to a clamp in accordance with the invention, contains two grip jaws 4, taking the form of thin-walled hollow body profiles and having a shape approximating that of a flat circle segment. In a transition area 5 each of the grip jaws 4, at their upper end section shown in the figure, passes into a pincer portion 6, also having the form of a narrow-walled hollow-chamber section. In the transition area 5, both grip jaws 4 with their integrally moulded pincer portions 6 are connected to each other by a crosspiece 7.

Clamp 3 is formed symmetrically to its longitudinal axis 8, and this applies also to the remaining embodiments of the invention. However, the invention is not limited to this and grip jaws 4 may also, for example, have different profiles on both their internal and external sides. Depending on the intended application, the insides of the grip jaws may be provided with toothed profiles, smooth profiles, round or, for example, serrated recesses and also special additional recesses for specific retaining brackets.

Fig. 1B shows the non-activated state of clamp 3, in which both grip jaws 4 lie in a position adjacent to each other and are held biased by virtue of the elasticity of crosspieces 7. Grip jaws 4 are opened by the action of pincer portions 6 which, diverging at an angle in their initial position, are pressed towards each other. This action elastically deforms crosspiece 7, which produces a corresponding amount of r storing force.

During a process of calibration, pressure may be applied onto the internal sides of pincer portions 6 - for example through roller pressure, in order to produce a biasing force sufficient for grip jaws 4, in the non-activated state of clamp 3 illustrated in Fig. 1B, to lie in a position adjacent to each other.

The main difference between the clamp shown in Fig. 2A to 2C and the first embodiment lies in the fact that the closing force of the clamp prevailing in the state shown in Fig. 2B is increased by the action of a spring clasp 9, which forces apart pincer portions 10. Spring clasp 9 consists appropriately of metal but may also be a plastic clasp. Naturally, other forms of leaf spring, or a coil spring, may also be used. In the area close to grip jaws 4, pincer portions 10 have a hollow chamber section P and ends 11 which are bent inwards in the form of hooks to act as a retaining support for spring clasp 9.

Fig. 2C shows the compressed state of both pincer portions 10 which opens grip jaws 4 and compresses spring clasp 9, so that it develops a high degree of restoring force.

In the third embodiment of the clamp according to the invention, illustrated by Fig. 3A to 3C, pincer portions 10, which are formed by bent-inwards extensions 12 of pincer portions 10, are integrally connected with a spring device. The free ends of extensions 12 are adjacent to each other (reference numeral 13), which may be achieved by initially continuously extruding extensions 12, i.e. joined together, and then cutting them open in a later step.

However, the scope of the invention allows for the extensions 12 to remain joined together. Selecting a suitable wall thickness for extensions 12 and also for the transition area 14 enables the desired restoring force of this spring device to be set. In the case of the embodiment form illustrated, xtensions 12 enclose an angle of approximately 60°, without restricting the invention thereto.

Fig. 4A to 4C show a grip in which, in contrast to the clamps described above, the grip jaws here designated as 15 and in the non-activated state of the grip according to Fig. 4B, are opened, i.e. spread apart. Grip 16 may be operated with one hand by pressing pincer element 17 inwards from the initial position shown in Figure 4B by spreading the pincer portions 10, the pincer portions 18 in addition being bent outwards with grip jaws 15 lying adjacent to each other, before webs 19, moulded to their ends, snap into the over centre position shown in Figure 4C. In this way, the closed condition of grip jaws 15 is reliably maintained.

Webs 19 are connected to the upper ends of pincer portions 18 by means of film hinges 20 which enable webs 19 to swing from the position depicted in Fig. 4B into the arresting position shown in Figure 4C, without, however, allowing further movement inwards due to their residual wall thickness and hence their rigidity, without which grip jaws 18 would otherwise open. This means that the film hinges are formed by areas of reduced wall thickness, which nevertheless still have a degree of rigidity such that the condition shown in Fig. 4C is maintained.

This could also be achieved by causing, in the angular position of webs 19 illustrated in Figure 4A, the inner faces of the webs to hit, for example, against corresponding inner faces of pincer portions 18, thus excluding any further swivelling movement. The pincer element 17, which has a hollow profile, is also connected on both sides by means of film hinges to webs 19, so that, here also, the necessary freedom of movement is guaranteed.

The closed state of the grip in accordance with Fig. 4C may also be reversed by pulling the pincer element 17 upwards as shown in the figure, or lateral pressure may be applied onto pincer portions 18 with the result that webs 19 are moved upwards as a result of the temporary additional spreading of pincer portions 18.

With all embodiments of the clamping device in accordance with the invention, grip jaws 4 and/or 15 are so designed that they come into contact with each other with the short clamping fac 22. The invention is naturally not limited to this and, indeed, the inner and the outer faces of the grip jaws may have all kinds of appropriate contours. Particular attention is here drawn to the embodiment in accordance with Figure 7A, where the clamping face 22 is produced by co-extrusion with a softer plastic 23. This significantly increases the retaining force of clamping device 3. In order to improve the gripping power of the clamping device a softer face 23' in the top outer region of pincer portions 18 may be co-extruded and equally so in area of connection 5 to form crosspiece 7, or also spring device 9 and/or 12.

In Fig. 5 and 6 a particularly preferred embodiment of extruded plastic clamping device 3 is shown. Here, the two symmetrical half-profiles 3' of clamping device 3 along centre line 8 are made using the extrusion process with hollow-chamber profiles P which follow the direction of extrusion (cf. also Fig. 4A) and then, as is illustrated in each case on the right-hand half, are welded together in transition area 5, preferably immediately after the extrusion process by means of fillet welding, where both half-profile sections 3' are pressed onto each other. An important factor here also is the formation of hollow-chamber profiles P with webs 18' running transversely to the direction of actuation since, in this way, and despite the very thin boundary-forming walls and correspondingly diminished use of materials, a particularly high level of stiffness for the pincer portions and/or the grip jaws is achieved. Moreover, welding both half-profiles 3' of the clamping device can achieve a predefined biasing force.

Fig. 6 shows a modified embodiment to which a spring device 12, similar to that shown in Fig. 3, is integrally moulded. Spring device 12 may comprise two single spring legs or one continuous

leg arc. However, to increase the biasing force, a separate clasp spring 9 may be used as shown in Fig. 2C.

Fig. 7B shows a further embodiment of the clamping device since both half-profiles 3' of clamping device 3, integrally joined together in the transition area, are here also identical and may be joined together by a snap connection 30, a process in which the walls running in the direction of extrusion are pressed together in the transition area 5 on the one hand in the interior part of snap connection 30, whilst the encompassing part of identical design is forced apart. This applies considerable biasing force on the clamping device 3. Particular attention is drawn to the fact that both half-profiles 3', joined together to form integral clamping device 3 and which, as has already been stated, is preferably produced by a process of extrusion, are in mirror image relative to each other, thus forming a rigid, non-flexing joint which has a rhombic cross-section or, if the cross-section is cylindrical, a ball-headed joint.

Fig. 8 illustrates a variation to clamping device 3, in which once again clamping device 3, equipped with hollow-chamber profiles P to reduce material consumption, can be joined together to form a multiple grip and thus be extended as desired. This means that several bags or stacks of paper can be gripped together. Naturally also, more than three such grip jaws may be provided whereby, in the illustration shown here on the right with three grip jaws, the centre grip jaw can, for example, also be positioned overhead so that, as a result, clamping can take place not only in the lower area shown here, but also in the top area in each case. This means that the pincer portion is used at the same time as a grip jaw. This dual benefit brings about further potential uses, for example, by clamping the upper area to a washing line, whilst in the two lower clamping areas, two socks or similar items of washing can be clipped in pairs but separated from each other.

It should finally be pointed out that, f r the purpose of making the integral plastic half-profiles of clamping device 3, the halves illustrated in Fig. 5 to 8 can also b bonded tog ther by adhesive, especially in a continuous bonding process, even if fillet welding is preferred straight after the extrusion process. All these manufacturing processes thus arrive at a clamping device 3 which uses up a minimal amount of material and, despite thinner walls, guarantees a high level of rigidity and a powerful clamping force. The respective biasing force can easily be varied for the different intended applications, for example, by the strength of the bonding force in the transition area 5 or by the angle of inclination of the connecting point 5' in the transition area 5, as is shown in Fig. 5 in the second position from the left.